UNIVERSITI PUTRA MALAYSIA

BUILDING COST COMPARISON BETWEEN CONVENTIONAL AND SOME SELECTED INDUSTRIALISED BUILDING SYSTEMS

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By

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Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of Requirement for the Degree of Master of Science

August 2002

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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August 2002

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The Malaysian construction industry is undergoing a transitional change from an industry employing conventional technology to a more systematic and mechanised. This new system is now known as the industrialised building system (IBS). The new methods of construction can increase productivity and quality of work through the use of better construction machinery, equipment, materials and extensive pre-project planning. This study becomes very necessary since there is yet no organised body, which can provide the necessary information on the building cost comparison between the conventional and industrialised building system in Malaysia's construction industry.

The thesis addresses the building cost comparison of the conventional system and industrialised building system of IBS A, IBS B, and IBS C. It provides the detail building cost to show cost savings amongst the conventional system and the IBS. The data were collected through questionnaire survey and case studies, which consisted of residential and institutional buildings.

Through the t-test it is shown that there is a significant difference of cost saving for the conventional system as compared to the industrialised building system.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk Ijazah Master Sains

PERBANDINGAN KOS BANGUNAN DI ANTARA KONVENSIONAL DAN BEBERAPA SISTEM BANGUNAN BERINDUSTRI YANG TERPILIH

Oleh

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Industri binaan di Malaysia, kini menyusur ke alam perubahan iaitu daripada industri yang mengunakan teknologi tradisional kepada yang lebih sistematik yang melibatkan jentera. Kaedah baru ini juga dikenali sebagai sistem bangunan berindustri. Kaedah baru binaan bangunan ini dapat meningkatkan produktiviti dan kualiti kerja menerusi penggunaan mesin, peralatan yang lebih baik, bahan binaan dan juga di peringkat perancangan projek. Kajian ini amat berguna memandangkan keadaan dimana masih tidak terdapat sebuah organisasi yang dapat menyediakan maklumat keperluan seperti perbezaan kos bangunan diantara sistem tradisional dengan sistem bangunan berindustri di dalam industri binaan di Malaysia.

Kajian ini menerangkan tentang perbezaan kos bangunan diantara sistem tradisional dengan sistem bangunan berindustri yang terpilih. Ianya menyediakan maklumat perbezaan kos secara terperinci dengan menunjukkan penjimatan kos diantara kaedah binaan tradisional dengan kaedah binaan berindustri. Data dikumpul melalui kajian soal-slidik dan juga kajian kes meliputi bangunan kediaman dan juga institusi pengajian.

Melalui 't-test' didapati terdapat perbezaan yang nyata berkenaan dengan penjimatan kos oleh sistem binaan tradisional berbanding dengan sistem binaan berindustri.

ACKNOWLEDGEMENT

First of all, I would like to express my deepest thanks to The Almighty Allah s.w.t. for giving me the strength, patience and never ending courage in completing this project.

The author wishes to thank Associate Prof. Ir. Dr. Mohd. Razali Abdul Kadir, Ir. Salihuddin Hasim and Associate Prof. Ir. Dr. Md. Yusof Ismail for their concern and encouragement toward the completion of this study.

The author further wishes to express his appreciation to En. Mohd. Hanafi Atan of AMD Associate for their cooperation in this study. The author would also like to extend his sincere appreciation to En. Rahmat Kislan of Baktian Sdn. Bhd., En. Ng Keh Seng of PJD Concrete Products Sdn. Bhd. for their assistance in providing the building cost data.

Last but not least, my sincere thanks from the bottom of my heart to my beloved Mama, Papa, Sister, Brother and Ayu for their love, support and encouragement.

I certify that an Examination Committee met on 15th August 2002 to conduct the final examination of Nuzul Azam Hj. Haron on his Master of Science thesis entitled "Building Cost Comparison Between Conventional and Some Selected Industrialised Building Systems" in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

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DECLARATION

I hereby declare that the thesis is based on my original work except for equations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.

(NUZUL AZAM HJ. HARON)

Date: 20/11/2002

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CHAPTER I

Introduction

1.0 Introduction

The Malaysian construction industry is undergoing a transitional change from an industry employing conventional technology to a more systematic and mechanised industry employing the latest computer and communication technology. This is vital for the future health of the industry, given the trend towards global competition and the advent of k-economy.

As we enter the era of the k-economy, a world of stiff competition awaits us. Global players compete to provide unique services, processes, materials and systems which promise better quality, higher speed and at better costs. There is a deep concern that the construction industry as a whole is underachieving. It has for many years maintained the time-tested but labour intensive traditional approach in construction and investing too little in research and development and training even in this knowledge (Ali, 2000).

As Malaysia progressively marches towards industrialisation, the role of the building industry is greatly enhanced with the idea to transform the aspirations and needs of the people into reality. In the 7th Malaysia Plan, some 800,000 houses shall be built, to fulfill the government's pledge of a home for every Malaysian. There is thus an urgent need to mass produced quality housing, affordable to all Malaysians. New and innovative

approaches and technology in the design and construction of houses are needed to enable the nations to achieve this target (National Housing Department, 1997). In the Malaysian context, the government's policy on housing is that, the traditional building practices must be replaced by Industrialised Building System (IBS), which could save on labour, cost and time of construction and confers quality and durability (Elias, 2000)

Prefabrication is a key towards increasing buildability. However, pre-cast concrete components and prefabricated reinforcement are still not commonly used in the private sector. This, to a great extent, is due to uncertainties about their cost and their ability to meet the aesthetic and other design requirement of developers (Tan E.P., 1997)

The construction cost of a building using pre-cast components should be assessed in its overall context. The traditional method of costing by material quantities with a fixed factor for labour cost can lead to incorrect estimation. For example, if labour usage is halved, this will more than compensate for a 10 percent material increase. More importantly, work completion will be faster. Furthermore, if properly designed and executed, pre-cast can eventually result towards better quality of work. The overall cost impact of pre-cast has therefore to take all these factors into consideration. With the rising costs of labour and less assurance of dependable skilled manpower, the trend is that pre-cast construction will become increasingly competitive compared to cast-in-place construction (CIDB, 1997)

1.1 Problem Statement

The Malaysian construction industry grew from 11% to 14% between 1992 to 1996 but dropped sharply in 1998. The construction boom increased the demand for workers from 250,000 in 1990 to some 750,000 in 1998. The large workforce includes a 50% increase in the number of foreign workers brought into the country. The recession however caused the slowdown of the industry, resulting in the retrenchment of workers and a large number of uncompleted projects. Thus there is a need to improve productivity in the construction industry, which will necessitate the use of new materials and construction techniques (CIDB, 2000).

Industrialisation involves the rationalisation of the whole process of building. It includes the process of design, the forms of construction used, and the methods of building adopted. This is to ensure that the design is well integrated. There must also be proper co-ordination between the three processes viz. supply of materials, fabrication, and assembly. All these factors will contribute towards speedier construction. Hence, resulting less labour on-site and less cost (Friedman and Cammalleri, 1993).

Cost research in the construction industry involves the investigation of all matters, which affect the costs of construction, either initially or throughout the building's life. The research may be done for the benefit of the client, contractor or developer or to suit the needs of professionals in the industry. Some of the research that has been undertaken in the past has been directly related to improving the quality and scope of the

professional services offered to the industry. Empirical evidence rather than rule-of-thumb should be the practised here. It is hoped that there will be better understanding, which will allow better service to be provided with a greater level of confidence (Ashworth A., 1994)

In so far there is yet no organized body, which can provide information readily on a guideline or benchmark for building cost comparison especially between conventional and industrialised building system in Malaysia's construction industry. Hence, the focus of this particular study.

1.2 Research Objective

With respect to the afore-mentioned research questions, the objectives of this study are as follow:

1. To establish the method of cost estimating for building construction
2. To establish the building cost comparison between conventional and some selected industrialised building systems.

1.3 Significance Of Study

The building industry in Malaysia today has undergone many innovations. It is important therefore at this present time that many aspects of the building industry are studied (Nuzul *et* al., 2002). One of which is to study about the building cost comparison between conventional and some selected industrialised building system.

Usually, the developer or client will try to get information from consultants on what system to be used in their project (conventional or industrialised building system). The consultants will suggest to the developer or client according to their past experiences. There is no organised body, which can provide information readily on guideline, or benchmark for building cost comparison especially between conventional and industrialised building system in Malaysia's construction industry.

Hence, it is timely that a study to establish the cost of building construction between conventional system and industrialised building system is made. In addition, this study will also attempt to establish the costs of building construction using different building construction methods.

The findings of this study can be used to serve as a guideline or benchmark for the construction industry concerning building cost and cost comparison of conventional method against industrialised building system. The study would also help to build a better understanding of the building costs system that are being practised in Malaysia. They could assist

developers and consultants to choose whichever is better either conventional or industrialised building system in terms of building cost saving.

1.4 Scope and Limitation

1) Only Conventional and Industrialised Building System in Malaysia will be considered in this study
2) The study is limited to client or developer, consultant, contractor and supplier
3) The study is limited to building cost only (infrastructure cost and overall construction costs are excluded)

1.5 Thesis Overview

This thesis contains six chapters. The summary of each chapter is described as below.

Chapter I, gives a brief description of the Malaysian construction industry. The aims, objectives, and justification of this study are specified. It includes also the overall content of the whole thesis.

Chapter II, includes a literature review in the field of building construction cost and the building cost comparison of Conventional and Industrialised Building System. In addition, a classification of industrialised building systems is also included.

Chapter III, sets the methodology followed during this study. The design and implementation of questionnaire survey and case studies are given. The analytical methodology adopted is also briefly described.

Chapter IV, the outcome of analysis, results and discussion for the building systems are presented and discussed.

Chapter V, the case studies are discussed. These case studies are cost comparison of building projects carried out under Ministry of Housing and Local Government, Public Works Department and others Private Sector.

Chapter VI, presents a summary of the findings and conclusions drawn from this research and recommendations for future research.

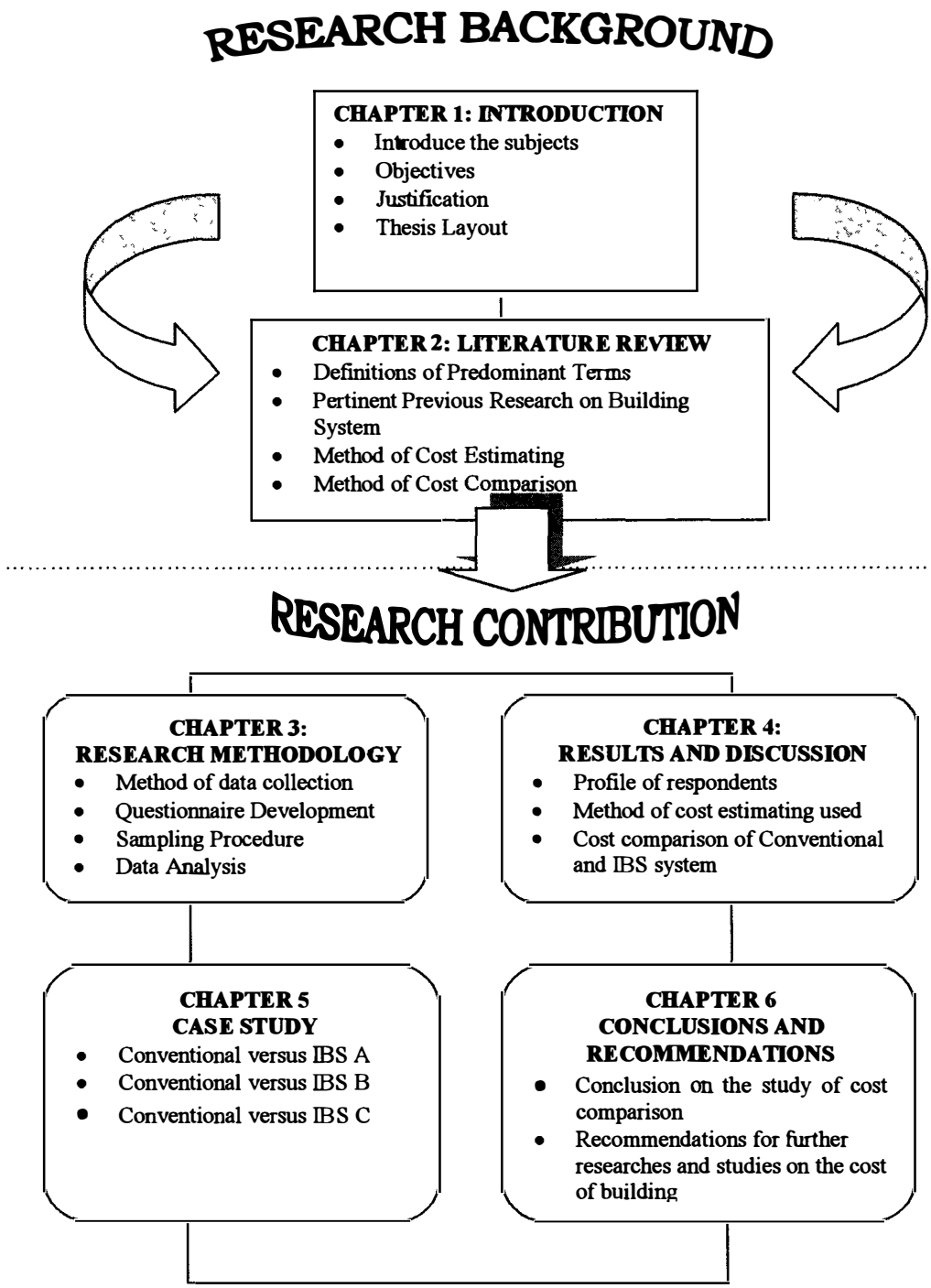

Figure 1.0 Thesis Layout